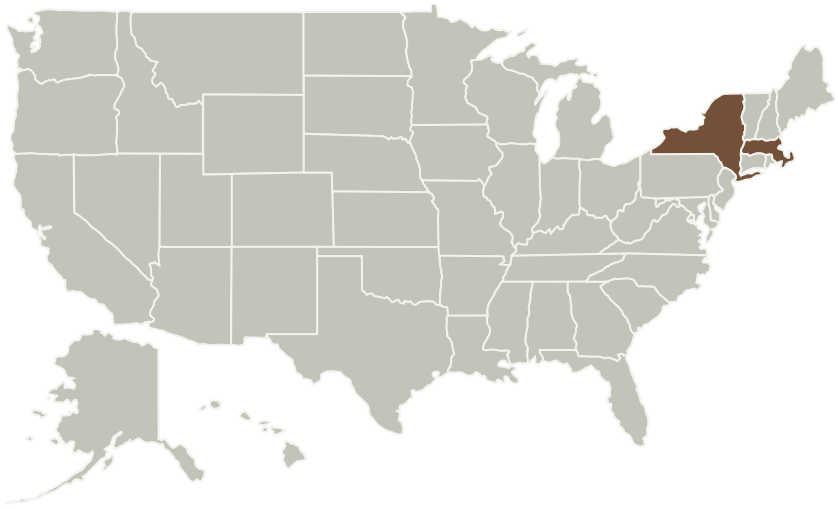
Continuing Progress in Soft X-ray Polarimetry

Completed Technology Project (2015 - 2017)

Project Introduction

We propose to continue our successful program in which we fabricate, test, and combine soft X-ray polarimeter components in a laboratory setting. These components are designed to be part of a system to measure the polarization of astrophysical X-ray sources at energies below 1 keV. We propose to improve, assemble, or fabricate components such as laterally graded multilayer coated mirrors (LGMLMs), transmission gratings, and reflection gratings that can be qualified for space use and test the resultant system with unpolarized and polarized X-rays. Our plan provides a development path to incorporate polarimetry as an integral part of X-ray astronomy missions or as a stand-alone observatory, improving the minimum detectable polarization for a flight mission by a factor of five. We would use the laboratory work described here to demonstrate the function of hardware that we will propose for flight observations. We have these specific component-level objectives: 1) accurately assemble LGMLMs with disparate material coatings in order to optimize performance over a wide range of energy, 2) advance multilayer coating techniques in order to improve the reflectivities of LGMLMs, 3) enhance tolerance to system misalignment via development of in-depth graded LGMLMs, and 4) fabricate and assemble blazed reflection gratings with modest spectral resolution but high reflectivity and dispersion for use in polarimeters. All components will be tested individually and within our soft X-ray polarimetry beamline, capable of generating and rotating 100% polarized X-rays over the 0.17-0.70 keV band.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

Astrophysics Research and Analysis

Project Management

Program Director:

Michael A Garcia

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Organizations Performing Work	Role	Type	Location
Massachusetts Institute of Technology(MIT)	Supporting Organization	Academia	Cambridge, Massachusetts
Reflective X-Ray Optics LLC	Supporting Organization	Industry	New York, New York

Primary U.S. Work Locations	
Massachusetts	New York

Project Management *(cont.)*

Program Manager:

Dominic J Benford

Principal Investigator:

Herman L Marshall

Co-Investigators:

Michael P Corcoran
David L Windt

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes

Target Destination

Outside the Solar System